

# o.HI.o.TEK

Northeast Ohio's Nascent High-tech Sector

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# How to Make A High-Tech Presentation Sexy: Use a Picture of a 19<sup>th</sup> Century German General!

- **Strategy is a system of expedients; it is more than a mere scholarly discipline.** It is the translation of knowledge to practical life, the improvement of the original leading thought in accordance with continually changing situations.
- **No plan of operations extends with any certainty beyond the first contact with the main hostile force.**

*Field Marshal Helmuth von Moltke the Elder (1800 – 1891), Architect of Germany's Wars of Unification (1864-71)*





# Cleveland: Northeast Ohio's Canary In the Coal Mine, Frog In the Pot, Crab In the Barrel...

- Each of these clichés means something different and yet they are used interchangeably
- Cleveland is the cultural, legal, financial and manufacturing capital of Northeast Ohio and Cleveland's success or failure impacts the region disproportionately
- The region's decline, beginning with the recession in 1980-81, and continuing over the next 40 years lead to population decline and the exit of businesses from the region (say goodbye tax base!)
- Some research indicates the decline started in the 1930's when big industry consolidated R&D into itself, squelching innovation and entrepreneurship
- Northeast Ohio remains an excellent place live and raise families for most people, but rural and urban populations continue to be impacted by disproportionate levels of poverty
- Not prioritizing the high-tech sector means missed opportunities and significant future disruption to citizens and business sectors alike (think 1980 on steroids – who doesn't like 20% interest rates! )

Photo © 2010 [J. Ronald Lee](#).

# History Doesn't Repeat Itself But it Does Rhyme

Historically, Cleveland area leaders have engaged in activities that have attracted billions of dollars to the city and the region during times of adversity

- Cleveland Tomorrow, 1980-1996, during a time of great disruption across the industrial Midwest
- Great Lakes Exposition, 1936-1937, Following the Great Depression

What is the next rhyme in the song of Cleveland?

- Growing the region's high-tech sector is an incredible opportunity
- It is time again for leaders and citizens of Northeast Ohio to start thinking and acting differently

The Moondog Coronation Ball was a concert held at the Cleveland Arena in Cleveland, Ohio, on March 21, 1952. It is generally accepted as the first major rock and roll concert.





# If You Don't Like Change, then You'll Hate Extinction

- Technological disruption is something Northeast Ohio can count on
- The question is do we want to be leaders and producers of high technology solutions or simply consumers?
- Where on the high technology adoption scale is Cleveland now and where does Cleveland need to be in order to benefit from technological disruption
- Does business and industry understand the threats and opportunities?
  - Jeffery Mining Company, based in Columbus Ohio, ruled the worldwide mining equipment manufacturing business for decades until the 1940's when it decided that off-track machines were a fad and decided that fixed-track technology was the only way.  
[https://www.jeffreyco.com/docs/Short\\_History.pdf](https://www.jeffreyco.com/docs/Short_History.pdf). The company spent decades recovering from this mistake in judgement.
  - Biotech, Internet of Things and AI technology is industry's "fixed-track moment"
- Are we thinking and talking about technology in the right way in our businesses, schools and communities?

*Brontosaurus*, 1897, Charles R. Knight

“Just because you cannot fix the world  
does not excuse you from trying”

A wise old saying

# If Northeast Ohio Was a State

- It would be the 26<sup>th</sup> most populous state in the United States, larger than: Kentucky, Oregon, Oklahoma, Connecticut, Iowa, Utah, Nevada, Arkansas, Mississippi, Kansas, New Mexico, Nebraska, West Virginia, Idaho, Hawaii, New Hampshire, Maine, Montana, Rhode Island, Delaware, South Dakota, North Dakota, Alaska, District of Columbia, Vermont, Wyoming
- If Northeast Ohio was a country, it's GDP is equivalent to the GDP of Ireland or New Zealand

The population fine print:

The Cleveland combined statistical area (CSA) is the 16<sup>th</sup> (3,485,691) most populous out of 171 different combined statistical areas (CSA) in the USA Columbus CSA is #28 (2,398,297) and Cincinnati CSA is #32 (2,208,450 million people).

[https://en.wikipedia.org/wiki/Combined\\_statistical\\_area](https://en.wikipedia.org/wiki/Combined_statistical_area). \*Add approximately 500,000 people more if Youngstown CSA is included, minus PA county of Mercer. Add another 500,000 or so for the rural counties... approximately 4.5 million people!

The cities of Cleveland, Akron, Canton & have all experienced population decline, but their suburbs have only recently leveled off in population growth.



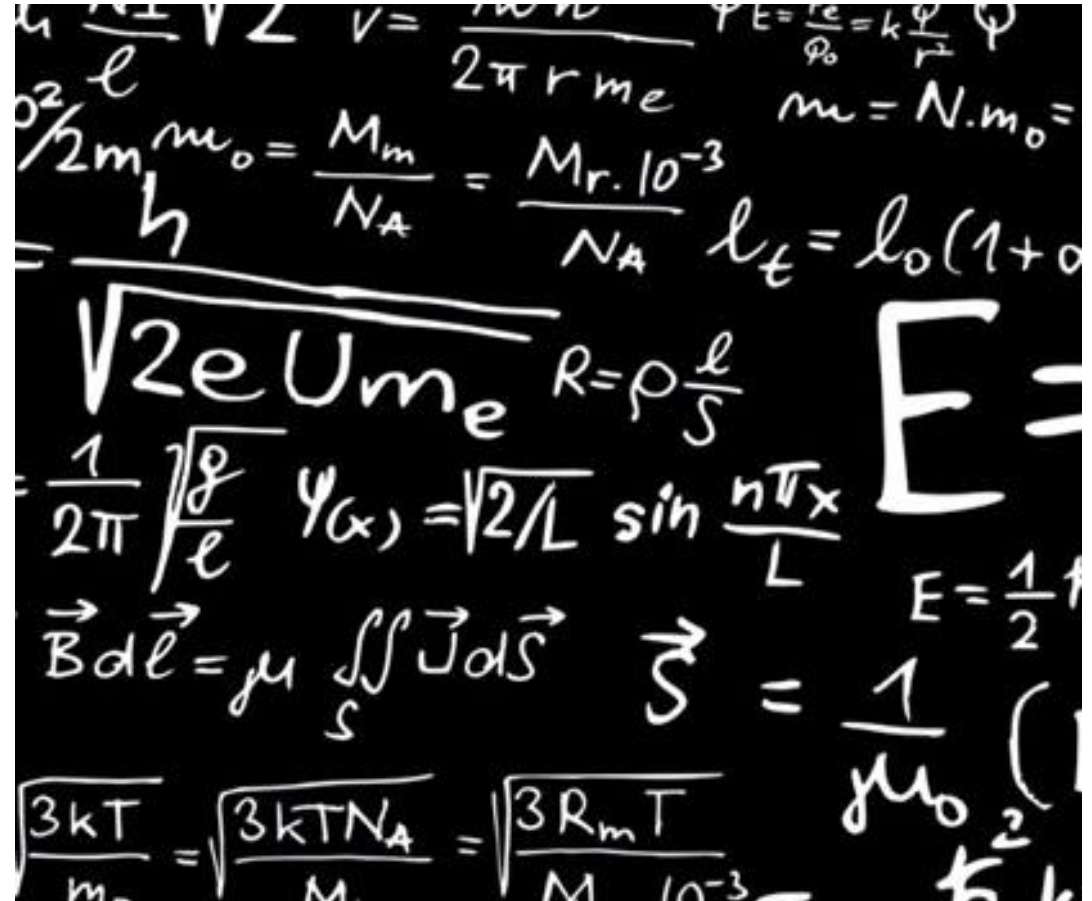
# Yankee Individualism Drives Our Vibrant Regionalism to This Day

- **American Nations: A History of the Eleven Rival Regional Cultures of North America** by Colin Woodard details the roots for the Yankee ethos of the region  
<https://www.goodreads.com/book/show/11140803-american-nations>
- **Yankee Individualism:** Individualism in social and economic affairs; belief not only in personal liberty and self reliance, but also in free competition
- I will defend my land from my neighbors
- I will collectively defend my land from the invading British with my neighbors
- I have an incredible work ethic and enjoy big collective tasks so long as these tasks don't encroach on my individual liberty

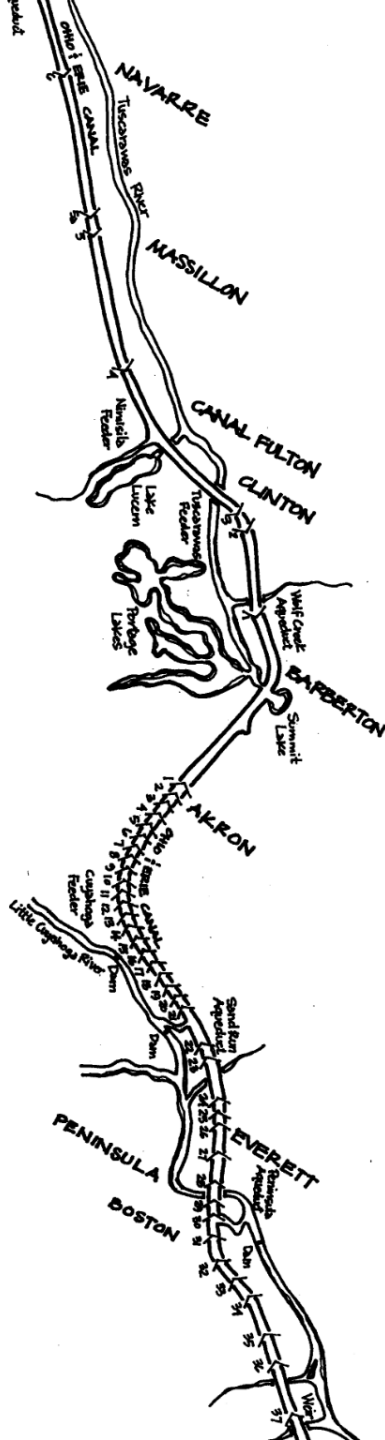
Loyalist newspaper cartoon from Boston ridicules "Yankee Doodles" militia who have encircled the British forces inside the city

# Vibrant Regionalism: The bad

- Northeast Ohio's vibrant regionalism "can prevent" a coordinated approach to attracting and developing businesses and institutions
  - Centralized/siloed approaches from regional players
  - A lack of shared resources
  - Different histories going back almost 200 years
  - Rivalries between regional, state and federal elected officials
  - Disconnect between private business, not-for-profit and government
- The Cleveland area's economic development effort is a mystery to those from elsewhere in Ohio and a very difficult mathematical equation to those who live in the area



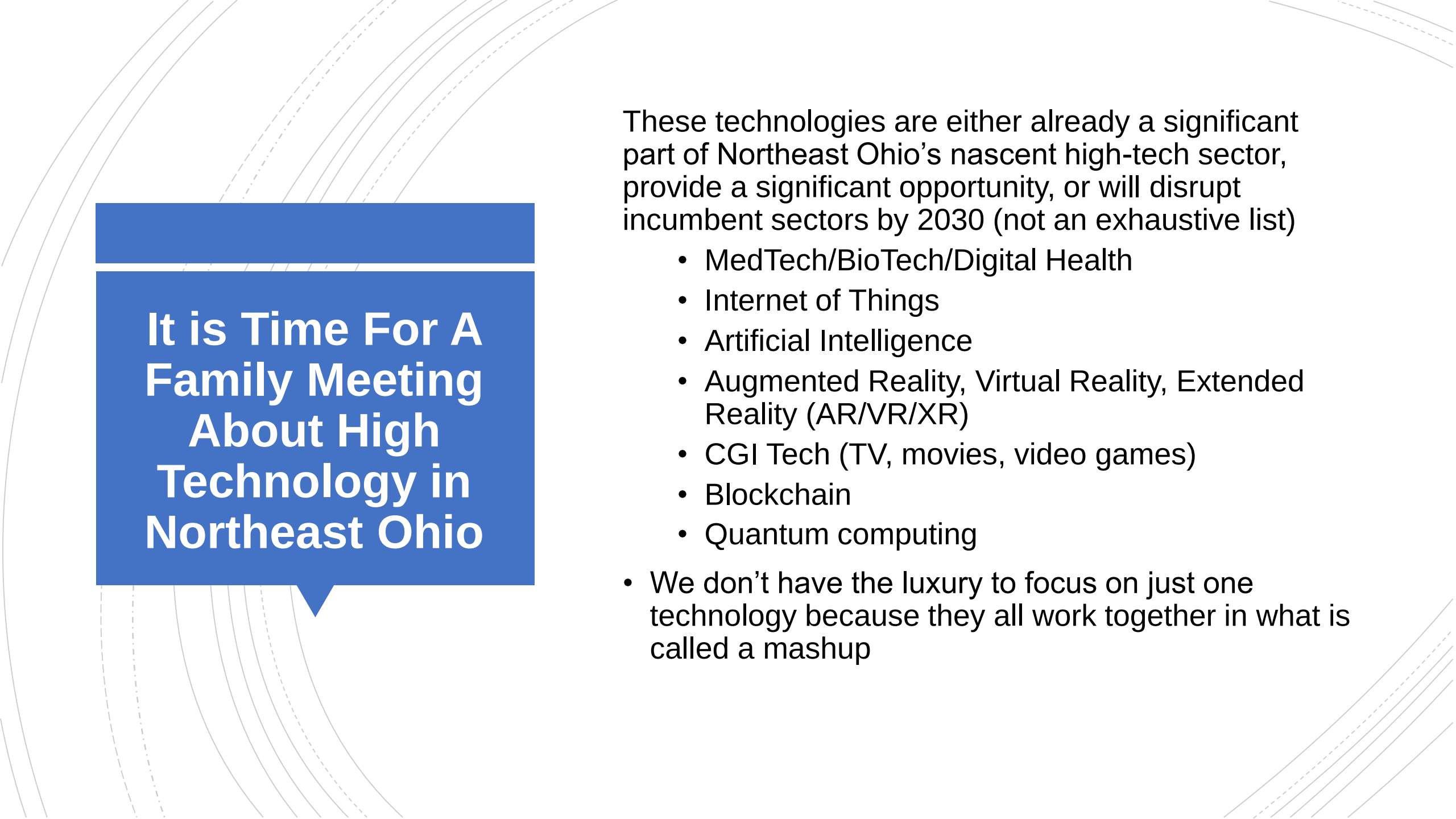
# Vibrant Regionalism: The Good



- We have been ‘wired’ from the beginning to think and act like a region
- The Ohio-Erie Canal that linked Cleveland and Akron more than 180 years ago is the area’s first “100 gigabit network” and led to explosive population growth in both cities. Ohio’s Grand Canal: A Brief History of the Ohio & Erie Canal, by Terry K. Woods, <https://www.goodreads.com/book/show/4999995-ohio-s-grand-canal>
  - Cleveland’s population was 606 people in 1820 after three decades of settlement and was 6,071 in 1840. Akron grew to 3,206 people by 1850, 25 years after being founded.
- The second “100 gigabit network” was the path of oil flowing to Cleveland refineries from Pennsylvania oil fields 160 years ago. *Titan: The Life of John D. Rockefeller*, Sr. by Ron Chernow <https://www.goodreads.com/book/show/16121.Titan>
- Northeast Ohio’s vibrant regionalism provides many options
  - Cleveland, Ohio’s largest downtown, rivals that of any large American city
  - The “big city” amenities and influence of Akron, Canton and Youngstown
  - The pastoral forested communities that ring the Cuyahoga Valley National Park
  - Overall the area has grown in population over the decades
- Because we are wired, a new high-tech sector for Cleveland will mean a new high-tech sector for the region and vice versa

# Vibrant Regionalism: The Opportunity

- **We need to let ourselves off the hook:** Things bigger than the region have led to where we are today: globalism, outsourcing, trade and labor relations; *Tailspin* by Steven Brill addresses many of our issues and makes suggestions on how to fix problems. <https://www.goodreads.com/book/show/37649549-tailspin>
- **We are in Control:** We are not starting from scratch because the emerging high-technology sector in Northeast Ohio is decades in the making.
- **Opportunities abound** for the business, non-profit and government sectors to collaborate on public/private partnerships, but this requires new ways of collaborating
- **Opportunity for citizens** to create opportunities for themselves abound through technology, especially in o2o (online to offline) services
- **New thinking is required** of area leaders to guide the growth of the high-technology sector and encourage the development of o2o services
- **We have an opportunity to make a huge difference and gain a competitive edge:** The high technology sector remains 50% less diverse than any other sector. Including everyone means more talent: <https://www.techrepublic.com/article/5-eye-opening-statistics-about-minorities-in-tech/>

The background of the slide features a series of concentric, curved lines in a light gray color, creating a sense of motion and depth. These lines are more prominent on the left side and fade towards the right.

## **It is Time For A Family Meeting About High Technology in Northeast Ohio**

These technologies are either already a significant part of Northeast Ohio's nascent high-tech sector, provide a significant opportunity, or will disrupt incumbent sectors by 2030 (not an exhaustive list)

- MedTech/BioTech/Digital Health
  - Internet of Things
  - Artificial Intelligence
  - Augmented Reality, Virtual Reality, Extended Reality (AR/VR/XR)
  - CGI Tech (TV, movies, video games)
  - Blockchain
  - Quantum computing
- We don't have the luxury to focus on just one technology because they all work together in what is called a mashup

# MedTech/BioTech/Digital Health



According to BioEnterprise: Cleveland's MedTech/BioTech/Digital Health sector is a \$5.6b sector that has grown 59% since 2000.  
<https://www.bioenterprise.com/bioscience/>



Health Tech Corridor in Midtown: 39 new businesses, 674 new jobs, nearly 300k sq. ft. new or absorbed development



Global Center for Health Innovation in downtown Cleveland is like no other facility in the world



HIMSS: Innovation and Conference Center provides health professionals, developers, business executives, investors, students, researchers, etc. with access to educational and business opportunities around healthcare



Plug and Play Cleveland's focus is MedTech – Plug and Play is an international accelerator that sees great potential in Northeast Ohio



Cleveland Clinic is a worldwide leader and provides a great incubator for competition and **collaboration**; Medical Innovation Summit:  
<http://medicalinnovationsummit.cvent.com/>

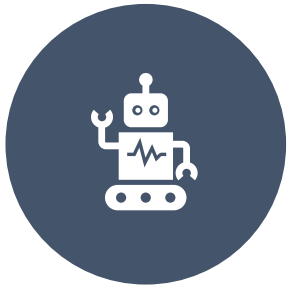


JumpStart Inc. has significant deal flow in MedTech startups: CoverMyMeds success story

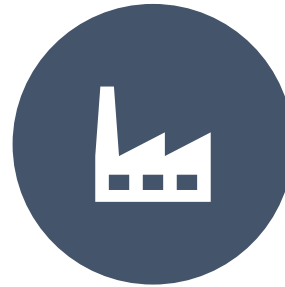


Medical Capital Innovation Competition (\$100,000 in prizes)

# IOT: Internet of Things



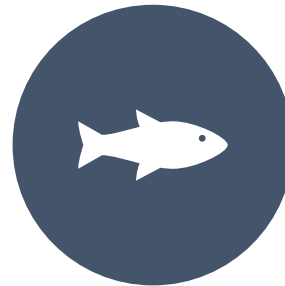
IOT Collaborative: a \$4m collaboration between Cleveland State University and Case Western Reserve University, <http://iotcollaborative.org/>



IIOT: Smart Manufacturing Industrial Internet of Things Roadmap for Northeast Ohio by TeamNEO released November 2018:  
<https://www.clevelandplus.com/business/news-press-and-updates/iiot-roadmap/>



Interaction between IOT and Artificial Intelligence (AI). IOT devices collect great amounts of data. AI runs off data wells. The implications for manufacturing are profound.  
<https://www.wired.com/brandlab/2018/05/bringing-power-ai-internet-things/>



Smart and Connected Water – “Erie: The Smart Lake,” Cleveland is ahead in this effort as compared to any other Great Lakes city. The Cuyahoga River sparked the modern environmental movement and could become one of the first smart rivers,  
<https://clevelandwateralliance.org/>



# Artificial Intelligence

- A.I.: Obama administration outlined a plan in October 2016 that is very detailed and mostly ignored:
  - [https://obamawhitehouse.archives.gov/sites/default/files/whitehouse\\_files/microsites/ostp/NSTC/preparing\\_for\\_the\\_future\\_of\\_ai.pdf](https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsites/ostp/NSTC/preparing_for_the_future_of_ai.pdf)
- Chinese government issued a similar plan at a similar time and has resulted in billions of dollars of investment across the country with cities vying to be AI tech hubs. The online to offline, o2o, business in China has transformed major cities going almost cashless with mobile payments being used for almost everything.
  - *AI Super-powers: China, Silicon Valley and the New World Order*, by Kai-Fu Lee. <https://www.goodreads.com/book/show/38242135-ai-superpowers>
- Deep learning was invented 10 years ago, like blockchain, and is going to drive/disrupt huge sectors of the economy
- How will Northeast Ohio be affected, and will it lead to even more decline if we keep on doing business how we are doing it today? (manufacturing will change, again...)
- What can we do to get out ahead of this coming disruption and turn it into an advantage?
- Northeast Ohio based Path Robotics is an early stage venture backed startup using AI and robotics to completely change how welding based on machine learning is done, [www.path-robotics.com](http://www.path-robotics.com)
- Studies are showing that when doctors use AI to help diagnose patients, the accuracy of diagnosis is greater than the doctor or the AI alone can provide. <https://www.technologyreview.com/s/612277/ai-cant-replace-doctors-but-it-can-make-them-better/>
- Human + AI = centaur or centaress. *Centaress*, by John La Farge, Brooklyn Museum, 1887

# Augmented Reality, Virtual Reality, Extended Reality (AR/VR/XR)

Case Western Reserve University is leading the world with its patents on Augmented Reality on HoloLens, according to Microsoft

There is no national hub(s) for augmented reality applications to date and Northeast Ohio has a massive opportunity to commercialize this technology

- Applications cut across all industries
- From cadaver-less labs to the manufacturing and maintenance of complex machinery to architecture and construction, the applications are limitless: <http://case.edu/hololens/>

# Blockchain

- An emerging, potentially disruptive technology invented in 2008 that will impact the largest players in technology
  - Government
  - FinTech
  - Insurance
  - Currency (the only 'killer app' so far)
- Blockchain protocol developers across the world generally agree that this technology is 2 to 5 years away from the development of the applications that could drive disruption
- That the technology is still emerging provides Northeast Ohio a great opportunity but the competition to be a blockchain hub is global
- Places like San Francisco and Tel Aviv are years ahead of most everywhere else in exploring potential applications, but the ongoing crypto bear market is dampening some of the enthusiasm
- That said, major corporations and governments are exploring blockchain. Major players are actively acquiring blockchain patents: August 2018, Alibaba, 90; IBM, 89; Mastercard, 80; Bank of America, 53; People's Republic of China, 44. *Bloomberg Businessweek*, December 17, 2018.
- *Life After Google: The Fall of Big Data and the Rise of the Blockchain Economy*, by George Gilder makes a case that blockchain combined with A.I. will force fundamental shifts in technology and the economy.
  - <https://www.goodreads.com/book/show/32073021-life-after-google>

# Quantum Computing



Microsoft believes that **Quantum computing** is one of three technologies that will transform the world along with **A.I.** and **Augmented Reality**. <https://www.bloomberg.com/news/articles/2018-06-29/why-quantum-computers-will-be-super-awesome-someday-quicktake>



Increase computational power of Quantum Computers will make today's supercomputers seem like common calculators: [https://motherboard.vice.com/en\\_us/article/evw93z/researchers-finally-proved-quantum-computers-are-more-powerful-than-classical-computers](https://motherboard.vice.com/en_us/article/evw93z/researchers-finally-proved-quantum-computers-are-more-powerful-than-classical-computers)



Quantum computing technology is projected to crack all current levels of cryptography and many of the platforms that secure online information. Read about post-quantum cryptography: [https://en.wikipedia.org/wiki/Post-quantum\\_cryptography](https://en.wikipedia.org/wiki/Post-quantum_cryptography)

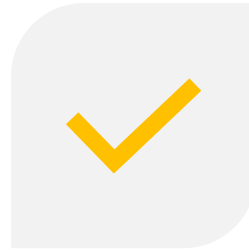


Recent breakthroughs at MIT with graphene based superconducting quantum bits (qubits) are a step toward **practical quantum computing**. <https://phys.org/news/2018-12-physicists-lifetime-graphene-qubits.html>

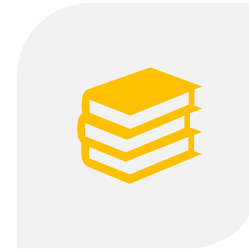


Case Western Reserve University is working with Microsoft on quantum solutions that combine quantum computing, AI and augmented reality toward advanced MRI technology called Magnetic Resonance Fingerprinting. <https://thedaily.case.edu/microsoft-partners-cwru-quantum-computing-magnetic-resonance-fingerprinting/>

## Wanted: High-Tech Teaching & Research Professors



IF WE WANT TO GROW OUR NASCENT HIGH-TECH SECTOR, WE NEED A ROBUST ARMY OF ACADEMICS DOING RESEARCH AND TEACHING STUDENTS ABOUT HIGH-TECHNOLOGY



HIGH-TECHNOLOGY PROFESSORS AT AREA UNIVERSITIES HAVE MORE PEOPLE THAN THEY CAN TEACH TRYING TO GET INTO RELATIVELY BASIC HIGH-TECHNOLOGY SURVEY COURSES



THE RUST BELT'S PRODUCTIVITY DECLINE BEGAN AS EARLY AS THE 1930S, **DUE LARGELY TO THE MONOPOLIZATION OF RESEARCH AND DEVELOPMENT** AND AN ASSOCIATED **DECLINE OF ENTREPRENEURSHIP**. *FROM METAL TO MINDS: ECONOMIC RESTRUCTURING IN THE RUST BELT* BY RICHEY PIIPARINEN, JIM RUSSELL AND CHARLIE POST, CLEVELAND STATE UNIVERSITY, 2015:

[HTTPS://WWW.ECOSYSTEMSINNOVATION.COM/WP-CONTENT/UPLOADS/2017/09/FROM-METAL-TO-MINDS-ECONOMIC-RESTRUCTURING-IN-THE-RUST-BELT.PDF](https://www.ecosystemsinnovation.com/wp-content/uploads/2017/09/From-Metal-to-Minds-Economic-Restructuring-in-the-Rust-Belt.pdf)

# It Is All About the Economy, and Jobs Too, duh!

- People live where there are jobs, or they become trapped by the cycle of lack of opportunity and poverty
- Northeast Ohio has been buffeted by the storms of globalism, trade, the exit of companies from the area, massive demographic shifts, and rapid changes in technology – this is our challenge and the growing technology sector can help
- Business, not-for-profit and government can't do it alone and none have all the answers. They need to work together and share resources
  - The American Prosperity Project at the Aspen Institute is a resource as Northeast Ohio plans for its high-tech future, especially around public/private partnerships
    - “America’s economic health depends on sustained, long-term investment to support our families and communities and to reinvigorate the economic engine that creates jobs and prosperity. There is no viable model under which either business or government can or should shoulder the responsibility for long-term investment alone; both are required”.  
<https://www.aspeninstitute.org/programs/business-and-society-program/american-prosperity-project/>
- Government has a role: [Podcast] Is the Government More Entrepreneurial than you Think? <http://freakonomics.com/podcast/mariana-mazzucato/>

# What about the “Valley of Death?”



Not enough series A thru B funding for start ups (\$500k and \$5m)



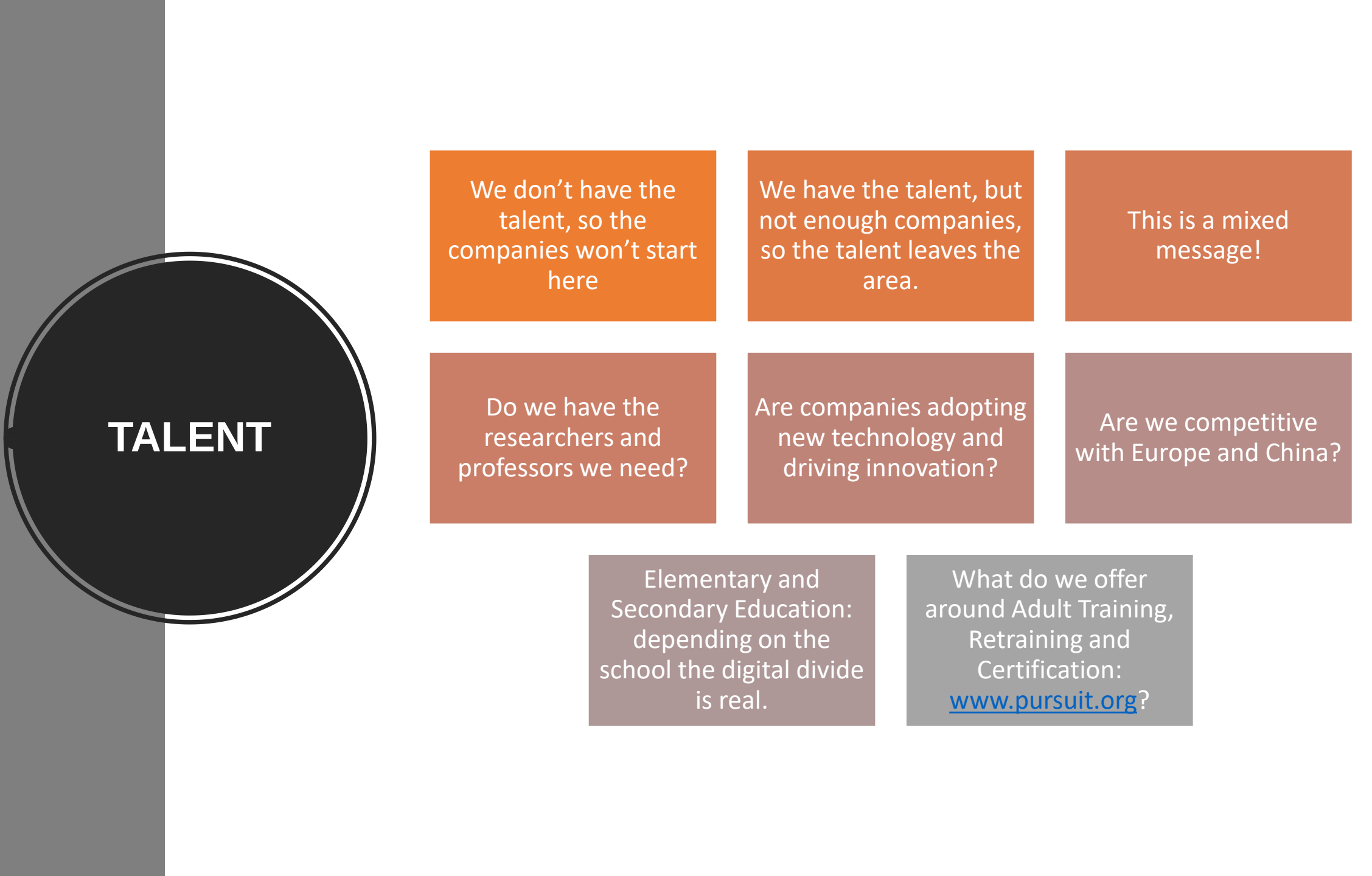
If you are growing slow series A thru B is a difficult area



Plenty of funding available at pre-seed and seed stage



Plenty of funding at the Series C stage



# TALENT

We don't have the talent, so the companies won't start here

We have the talent, but not enough companies, so the talent leaves the area.

This is a mixed message!

Do we have the researchers and professors we need?

Are companies adopting new technology and driving innovation?

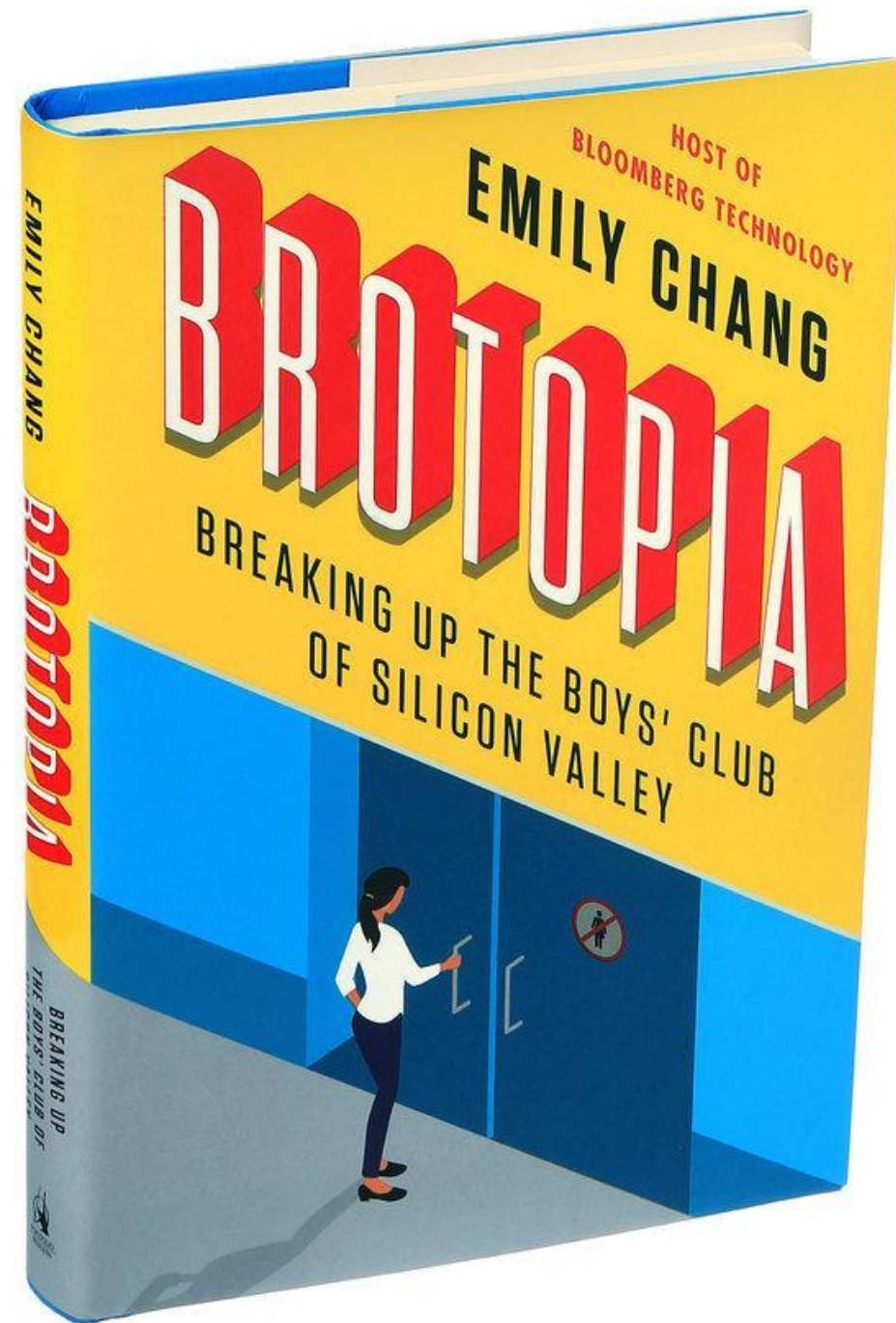
Are we competitive with Europe and China?

Elementary and Secondary Education: depending on the school the digital divide is real.

What do we offer around Adult Training, Retraining and Certification:  
[www.pursuit.org](http://www.pursuit.org)?

# How's That “Disruption Model” Working for You?

- Technology is increasingly segregating people between the haves and have nots in both access to technology and opportunities in technology
  - Discussions in Silicon Valley and beyond around a ‘universal income’ verifies this
    - <https://www.latimes.com/opinion/op-ed/la-oe-rushkoff-universal-basic-income-silicon-valley-20170721-story.html>
- Tech Bro Culture, which thrives on aggressive males using the disruption ethos has left everyone else behind. *Brotopia: Breaking Up the Boys' Club of Silicon Valley* by Emily Chang details this:  
<https://www.goodreads.com/book/show/36288143-brotopia>
- If we want to be truly disruptive, we have to make access and opportunity in technology more equitable as a fundamental part of any effort
- The coming global talent war will make diversity a no-brainer  
<https://www.cnbc.com/2018/06/20/silicon-valleys-diversity-problem-is-its-achilles-heel.html>



# We Can Do It!



## What story are we telling ourselves about our high-tech future?

- There is a difference between the perception of what is happening and the reality – **more is going on** than most realize
- The high-tech sector is more than the IT department.
- People **don't need to be a trained technology professional** to understand or appreciate the impact of technology
- Somewhere, somehow, **people have been taught that technology is too difficult** to understand or are intimidated by it, but pay attention to equally complicated subjects like NCAA Football Rankings
- **Exposure to technology topics** is key, but Northeast Ohio's opportunities for exposure are limited
  - Low-cost or free public talks featuring high-tech authors are needed. Many of these kinds of authors are mentioned in this presentation
  - Region-wide reading programs to collectively read books like *Startup Nation: The Story of Israel's Economic Miracle*, by Dan Senor and Saul Singer are needed: [https://www.goodreads.com/book/show/6885191-start-up-nation?from\\_search=true](https://www.goodreads.com/book/show/6885191-start-up-nation?from_search=true). Israel built its high-tech sector literally surrounded by enemies with few natural resources. Our last local war was in 1812!
- The laws of probability point to Northeast Ohio having a good chance of regaining its innovation crown, but it is going to take **work by everyone** to get the crown back



WAR PRODUCTION CO-ORDINATING COMMITTEE

“To leave the world a bit better, whether by a healthy child, a garden patch, or a redeemed social condition; to know that even one life has breathed easier because you have lived - that is to have succeeded”

— Ralph Waldo Emerson